Chemical Engineering Education in a Bologna Three Cycle Degree System

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Assuming design, the application of the engineering sciences to create profitable products/processes, remains at the pinnacle of engineering education and practice, key questions need to be addressed:

1. Will young educators work with ChE students to create product designs that don't focus on the process flowsheet – possibly using molecular modeling, CFD, ...? How will prerequisite engineering science courses be altered?
2. How will the emphasis on product and process design be allocated?
3. Will the recent resurgence of attention to energy, and related environmental and sustainability matters, regenerate active research and teaching of large-scale process design involving ChE faculty?

Chemical Engineering Education in a Bologna Three Cycle Degree System

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For the purpose of harmonization of European higher education, Europe's education system has been going through major changes under what is commonly known as the "Bologna Process". The Bologna declaration in 1999 was the start of the introduction of a three cycle degree system in higher education in Europe. To date, many European universities have adopted this degree structure. The Working Party on Education (WPE) of the European Federation of Chemical Engineering (EFCE) carried out research to determine the contents of higher education in chemical engineering (ChE) and related disciplines such as applied chemistry and process engineering throughout Europe. The result has been a set of recommendations for the first (BS), second (MS) and third (PhD) cycle chemical engineering education aligned to the Bologna Process. They recommend that students studying towards bachelor and masters qualifications should be measured on their level of knowledge and the understanding they develop, rather than the amount of time they spend with the tutors. The recommendations also suggest that students studying for a PhD or doctorate degree should be encouraged to further develop their abilities to manage independent research work. The importance of learning outcomes has been emphasized at all levels.

According to the Bologna Process, the first and the second cycle degrees should have different orientations and various profiles in order to accommodate a diversity of individual, academic and labour-market needs. Within Europe, two types of higher education in ChE can be found: more research-oriented or more application-oriented first cycle (bachelor) programmes. Both types of studies cover a period of 3-4 academic years and 60 credits per year. After completion of the first

cycle, students can continue their study with a second cycle program of ChE with 90-120 credits for a further 18-24 months. For the first and second cycles, the WPE of the EFCE adopt the European Accreditation of Engineering Programmes (EUR-ACE) framework and recommend a set of programme outcomes (knowledge and understanding, engineering analysis, engineering design, investigations, engineering practice and transferable skills) and a set guidelines (core curriculum, teaching and learning, industrial experience, review of the education process and student assessment) to achieve them. They also propose a minimum set of subjects required to define a course as chemical engineering and the level of achievement that might reasonably be expected at different levels.

The talk will give an overview of the recommendations of the WPE and highlight their implementation at the Technical University of Denmark's ChE programmes, whose accreditation has been approved by the EUR-ACE. Courses on process and product design will be used as examples.

- **14:00-16:00 hrs**
  Comida

- **16:00-18:00 hrs**
  Sesiones Orales II
  - Salón Bonampak 1:

HORA	CLAVE	ID	TÍTULO
16:00-16:20	INGA-06	758	LA VÁLVULA-S: MODELADO DEL FLUJO DE SÓLIDOS GRANULARES UTILIZANDO UN MODELO HIDRODINÁMICO
16:20-16:40	INGA-07	3	ESTUDIO DE LA TRANSFORMADA WAVELET DE SEÑALES ULTRASÓNICAS DURANTE EL PROCESO DE FERMENTACIÓN DE YOGURT
16:40-17:00	INGA-08	757	NUEVO MODELO DE CAPA DELGADA PARA LA CINÉTICA DEL SECADO DE GRANOS DE CACAO EN UN LECHO FUENTE
17:00-17:20	INGA-09	573	MODELACIÓN DE LA TEMPERATURA Y HUMEDAD DURANTE EL PROCESO DE TOSTADO DE GRANOS DE CACAO.
17:20-17:40	INGA-10	310	EFECTO DEL ORIGEN EN LAS PROPIEDADES INTRINSECAS DE LA GELATINA
17:40-18:00	INGA-11	843	THE RHEOLOGICAL BEHAVIOR OF RECONSTITUTED PITAYA JUICE POWDER

  - Salón Bonampak 2:

HORA	CLAVE	ID	TÍTULO
16:00-16:20	INGS-06	106	GLOBAL OPTIMIZATION FOR THE WATER INTEGRATION BASED ON PROPERTIES IN ECO-INDUSTRIAL PARKS
16:20-16:40	INGS-07	147	PHYSICAL RECYCLING OF TYRES BY MODIFIED ASPHALT FORMATION.
16:40-17:00	INGS-08	155	SYNTHESIS OF PROPERTY BASED WATER NETWORKS CONSIDERING THE SUSTAINABILITY OF SYSTEM
17:00-17:20	INGS-09	184	DEVELOPMENT OF A SYSTEM OF ANAEROBIC DIGESTION TO TREAT WASTE OF BROCOLI (BRASSICA OLERACEA)
17:20-17:40	INGS-10	222	PROCESS DESIGN FOR THE MILK FAT REDUCTION FOR THE WASTEWATER OF THE DAIRY INDUSTRY.
17:40-18:00	INGS-11	281	ECOTOXICITY ASSESSMENT OF DEGRADABLE PLASTICS IN SOIL USING AN INDICATOR PLANT SPECIES